CISC320 Algorithms, Homework set 1
Due Tuesday, Sept 14, 2010

1. Find a counterexample consisting of 4 points in the plane to the proposition that the closest pair algorithm (pg 6) produces a solution to the robot tour optimization problem (pg 5). Explain how the algorithm fails on your counterexample.

2. Exercise 1-5.

3. Exercise 1-12.

4. Exercise 1-18. This is the rather surprising identity that the square of the sum of the first n positive integers is the sum of their cubes. You can establish this identity directly by induction or you can do exercise 1.10 using induction and follow up by using 1-10 and 1-12 to establish this identity. The second approach may be simpler.

5. 2-2.

6. 2-7. Explain your reasoning.

7. 2-11.

8. a) Show that $n\log(n)$ is $\Theta(\sum_{i=1}^{n} \log(i))$.

   b) Show that $n\log(n)$ is $\Theta(\log(n!))$.

   Hint: for the lower bound, you can use the largest half strategy. You may also use the transitivity of Θ: if $f(n) = \Theta(g(n))$ and $g(n) = \Theta(h(n))$, then $f(n) = \Theta(h(n))$.